

PATENT ABSTRACTS OF JAPAN

(11)Publication number : **2000-119574**

(43)Date of publication of application : **25.04.2000**

(51)Int.Cl.

C09D 11/00

B41J 2/01

B41M 5/00

(21)Application number : **10-295727**

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(22)Date of filing : **16.10.1998**

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(54) METHOD OF INK JET PRINTING USING TWO-PACK SYSTEM

(57)Abstract:

PROBLEM TO BE SOLVED: To provide a method for ink jet printing capable of affording good print characteristics and high print scratch resistance, through printing on a recording medium by contact between an ink composition and a reactive solution to effect curing reaction.

SOLUTION: This method for ink jet printing comprises using an ink composition essentially comprising a colorant, an oligomer or the corresponding monomer, and an aqueous medium, and a reactive solution essentially comprising a polymerization initiator, the monomer or oligomer, and an aqueous medium; wherein when the ink composition or reaction solution contains the oligomer, the other party contains the monomer.

LEGAL STATUS

[Date of request for examination]

[Date of sending the examiner's decision of rejection]

[Kind of final disposal of application other than the examiner's decision of rejection or application converted registration]

[Date of final disposal for application]

[Patent number]

[Date of registration]

[Number of appeal against examiner's decision of rejection]

[Date of requesting appeal against examiner's decision of rejection]

[Date of extinction of right]

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CLAIMS

[Claim(s)]

[Claim 1] The ink-jet record method characterized by providing the following of printing by making an ink constituent and reaction mixture adhering to a record medium. The aforementioned ink constituent is a coloring material. Oligomer or either of the monomers. It comes to contain an aqueous solvent at least, and the aforementioned reaction mixture is a polymerization initiator. It comes to contain either a monomer or oligomer and an aqueous solvent at least, and an ink constituent or reaction mixture is oligomer.

[Claim 2] The record method according to claim 1 that the content of the oligomer in the aforementioned ink constituent is 1 - 50 % of the weight, and the content of the monomer in the aforementioned reaction mixture is 1 - 70 % of the weight.

[Claim 3] The record method according to claim 1 that the content of the monomer in the aforementioned ink constituent is 1 - 70 % of the weight, and the content of the oligomer in the aforementioned reaction mixture is 1 - 50 % of the weight.

[Claim 4] The ink-jet record method which comes to contain performing a hardening reaction after contacting the aforementioned ink constituent and the aforementioned reaction mixture by the record method according to claim 1 to 3 on a record medium.

[Claim 5] The record method according to claim 4 performed when the aforementioned hardening reaction carries out UV irradiation.

[Claim 6] The record method according to claim 5 which the aforementioned UV irradiation performs by the amount 100 of UV irradiation - 10,000 mJ/cm².

[Claim 7] The record medium printed by the record method according to claim 1 to 6.

[Claim 8] The recording device which comes to contain a means to be the ink-jet recording device which prints by using an ink constituent and reaction mixture according to claim 1 for a record medium, and to make a record medium, a means to make the drop of an ink constituent adhere on a record medium, and the drop of reaction mixture adhere on a record medium, an ink-jet record means to make the drop of an ink constituent, and the drop of reaction mixture adhere, and to make a picture form on a record medium, and a UV irradiation means.

[Claim 9] The recording device according to claim 8 which the aforementioned UV irradiation performs by the amount 100 of UV irradiation - 10,000 mJ/cm².

[Claim 10] The record medium printed by the recording device according to claim 8 or 9.

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DETAILED DESCRIPTION

[Detailed Description of the Invention]

[0001]

[Background of the Invention] The field this invention of invention relates to the ink-jet record method and ink-jet recording device which can use a polymerization nature resin for a record medium, and can perform good printing using 2 liquid of an ink constituent and reaction mixture.

[0002] The background technical ink-jet record method is the printing method which the globule of an ink constituent is made to fly and prints by making it adhere to record media, such as paper. This ink-jet record method has the feature that high resolution and a high-definition picture can be printed at high speed. As for the ink constituent used for the ink-jet record method, what contained wetting agents, such as a glycerol, in order to make an aqueosity solvent into a principal component and to prevent a coloring component and blinding to this is common.

[0003] When printing to record media manufactured on the other hand from resins, such as materials, for example, a phenol, such as paper in which a water-color-ink constituent cannot permeate easily, cloth or a metal not permeating, and plastics, a melamine, a vinyl chloride, an acrylic, and a polycarbonate, such as a board and a film, an ink constituent and reaction mixture are required to contain the component which a coloring material is stabilized and can fix to a record medium.

[0004] To such a demand, the ink constituent which comes to contain the component macromolecule-ized by ultraviolet-rays grant is indicated conventionally (for example, JP.3-216379.A). Moreover, the ultraviolet-rays hardening ink-jet ink which comes to contain a coloring material, an ultraviolet-rays curing agent, a polymerization initiator, etc. is indicated (for example, U.S. JP.5,623,001.B). According to these ink constituents and the ink-jet record method, a blot of the ink to a record medium is prevented and it is supposed that quality of image can be raised.

[0005] Moreover, the ink-jet record method of printing to a record medium is indicated using 2 liquid of the ink constituent which comes to contain a coloring material, and the reaction mixture which comes to contain a polymerization initiator in order to raise separation prevention of the color which is a coloring material, and ****-proof and to raise the drying property of improvement in printing reliability, the blot prevention after printing, or ink (for example, JP.5-186725.A, JP.8-218018.A).

[0006] If it is in the ink-jet record method using such 2 liquid, when an ink constituent and the reaction mixture which comes to contain a polymerization initiator are contacted in a record medium and ultraviolet rays are irradiated, the polymerization initiator in reaction mixture generates a radical etc., and oligomer and a monomer start a polymerization and make the coloring material in an ink constituent fix on a record medium. It is thought that the depth of shade is high and can realize few printing of a blot or nonuniformity by this fixing. Furthermore, it also has an advantage that an ink constituent and the preservation stability of reaction mixture improve by dividing an ink constituent and reaction mixture.

[0007]

[Summary of the Invention] this invention person etc. acquired knowledge that the shelf life of polymerization efficiency, film intensity, an ink constituent, or reaction mixture and life stability, and regurgitation stability can be raised notably in the ink-jet record method of printing such 2 liquid this time, by using for either an ink constituent or reaction mixture 2 liquid of the ink constituent and reaction mixture which come to contain a monomer on the another side coming [oligomer], this invention is based on this knowledge.

[0008] Therefore, this invention is the thing which carries out the purpose about offer of the ink-jet record method printed using 2 liquid with which a good picture is acquired.

[0009] According to the mode of 1 by this invention, it is the ink-jet record method of printing by making an ink constituent and reaction mixture adhering to a record medium, the aforementioned ink constituent And a coloring material. It comes to contain either oligomer or a monomer and an aqueosity solvent at least, the aforementioned reaction mixture A polymerization initiator. When an ink constituent or reaction mixture contains oligomer coming [either a monomer or oligomer and an aqueosity solvent] at least, the ink-jet record method that another side comes to contain a monomer is offered.

[0010] According to another mode of this invention, it is the ink-jet recording device which prints to a record medium using the above-mentioned ink constituent and above-mentioned reaction mixture. Furthermore, a record medium, A means to make the drop of an ink constituent adhere on a record medium, and a means to make the drop of reaction mixture adhere on a record medium. The drop of an ink constituent and the drop of reaction mixture are made to adhere on a record medium, and the recording device which comes to contain an ink-jet record means to make a picture form, and a UV irradiation means is

offered.

[0011]

[Detailed Description of the Invention] The ink-jet record method and the ink-jet record method by the equipment this invention print to a record medium using 2 liquid of an ink constituent and reaction mixture. When, as for an ink constituent, an ink constituent or reaction mixture contains [come // either / a coloring material and / oligomer or a monomer and an aqueous solvent / at least] oligomer coming / either / a polymerization initiator and / a monomer or oligomer and an aqueous solvent / at least, as for reaction mixture, another side comes to contain a monomer.

[0012] In this invention, when it divides into 2 liquid of the ink constituent which comes to contain a coloring material, and the reaction mixture which comes to contain a polymerization initiator and an ink constituent or reaction mixture contains oligomer, another side surely prints to a record medium using 2 say liquid coming [a monomer]. For this reason, polymerization efficiency, film intensity, an ink constituent or the preservation stability of reaction mixture and life stability, and regurgitation stability can be raised notably.

[0013] That is, in this invention, without mixing a coloring material and a polymerization initiator and making it one solution, a coloring material can perform a hardening reaction efficiently, an ink constituent and when it prints both, respectively and they are contacted by dividing a polymerization initiator into reaction mixture and containing, and it can raise the storage stability of an ink constituent. Furthermore, when an ink constituent or reaction mixture contains oligomer, without mixing oligomer and a monomer and making it one solution, another side can surely delay advance of the dark reaction in an ink constituent or reaction mixture by dividing excluding both oligomer and monomer (polymerization reaction) coming [a monomer]. Consequently, the preservation stability and regurgitation stability of an ink constituent or reaction mixture can be raised.

[0014] According to the ink-jet record method of this to this invention, a blot and printing nonuniformity of printing can be stopped on a record medium. Moreover, it can prevent effectively, the uneven color mixture, i.e., the color bleeding, in the border area of a different color often made into the problem in the color ink-jet record method. For this reason, the record object which quality printing excellent in coloring nature was obtained, and was excellent in ****-proof can be obtained.

[0015] Furthermore, if it is in the ink-jet record method of this invention, UV irradiation, heating, etc. carry out a record medium during record or after record. Thereby, it is clear also on the medium front face which cannot be permeated in water media, such as a metal and plastics, and the printing object excellent in ****-proof can be obtained.

[0016] According to the desirable mode of this invention, after contacting an ink constituent and reaction mixture, it is desirable to perform a hardening reaction. As a method for this, optical irradiation, UV irradiation, heating, etc. are mentioned and especially UV irradiation is desirable.

[0017] the case where UV irradiation is performed -- the amount of UV irradiation -- the range of about two 100 - 10,000 mJ/cm -- it carries out in the about two 500 - 5,000 mJ/cm range preferably If it is the amount of UV irradiation of this extent within the limits, a hardening reaction can be performed enough and there is little influence called fading [of the coloring material by UV irradiation].

[0018] As for UV irradiation, lamps, such as a metal halide lamp and a high-pressure mercury lamp, are mentioned. For example, Fusion It can carry out using things marketed, such as H lamp made from System, D lamp, and V lamp.

[0019] Heating irradiates the method and infrared radiation which a heat source is contacted to a record medium and heated, microwave (electromagnetic wave which has maximum-wave length in about 2,450 Mhzes), etc., or the method of heating without making a record medium, such as spraying hot blast, contact etc. is mentioned.

[0020] In this invention, an ink constituent and reaction mixture are contacted on a record medium. According to the mode of this invention, the process which makes an ink constituent adhere on a record medium may be performed before the process which makes reaction mixture adhere to a record medium, even if carried out after the process which makes reaction mixture adhere to a record medium.

[0021] Furthermore, the recording device which enforces the ink-jet record method by this invention is explained Shell composition of the ink-jet recording device of drawing 1 is carried out with the drive system of a means to make an ink constituent and reaction mixture adhere to a record medium, and a means to make them adhere, the means to which a record medium is moved, a means to heat with UV irradiation to a record medium, and the cleaning means.

[0022] Recording head 1a (and 1b) connected with ink tank 2b which has ink tank 2a and reaction mixture which have the ink constituent of this invention by the tube 3 moves in the direction of arrow A by the timing belt 6 driven by the motor 5 along with carriage 4. Between the movement, an ink constituent is breathed out from the nozzle side of recording head 1a, and it adheres to the record medium 7 put on the position which meets recording head 1a by the platen 8 and the guide 9. Next, the specified quantity transfer of the record medium 7 is carried out at the direction arrow B of an ejection. In the meantime, recording head 1a (and 1b) moves to Arrow A and an opposite direction all over drawing, and returns to the position at the left end of a record medium 7. And reaction mixture is breathed out from the nozzle side of recording head 1b by the record medium to which the ink constituent has already adhered, and printing is performed. A specified quantity transfer is carried out further at the direction arrow B of an ejection, and the printed record medium 7 receives the heat-treatment at UV irradiation with the UV irradiation lamp 15, and a heater 14. On the front face of the record medium 7 which received these processings, an ink constituent and reaction mixture cause a hardening reaction, and a coloring material fixes on a record medium 7. The record medium 7 with which printing processing was carried out is further transported to the direction arrow B of an ejection. In addition, to this equipment, it has the cap 10 with whom the suction pump 11 was connected, cleaning

operation is performed by these mechanisms, and it is ****. The attracted ink constituent can be collected on the waste ink tank 13 through a tube 12.

[0023] Although it may be any of a color and a pigment, when suppressing osmosis of the coloring component in an ink constituent by operation of insolubilization of an ink constituent, or thickening, the pigment of the coloring material contained in the ink constituent of an ink constituent A, coloring-material this invention currently distributed rather than the color which is dissolving into an aqueous medium is more advantageous.

[0024] As a color used by this invention, various colors usually used for ink-jet record, such as direct dye, acid dye, the food color, basic dye, a reactive dye, a disperse dye, a vat dye, a solubilized vat dye, and a reaction disperse dye, can be used.

[0025] An inorganic pigment and an organic pigment can be used without a special limit as a pigment used by this invention.

[0026] In addition to titanium oxide and an iron oxide, as an inorganic pigment, the carbon black manufactured by well-known methods, such as the contacting method, the furnace method, and thermal **, can be used. Moreover, as an organic pigment, an azo pigment (an azo lake, insoluble azo pigment, a disazo condensation pigment, a chelate azo pigment, etc. are included), polycyclic formula pigments (for example, phthalocyanine-pigment, perylene pigment, and peri non a pigment, an anthraquinone pigment, a Quinacridone pigment, a dioxazine pigment, a thioindigo pigment, an isoindolinone pigment, a kino FURARON pigment, etc.), color chelates (for example, a basic dye type chelate, an acid-dye type chelate, etc.), a nitro pigment, an oximido pigment, an aniline black

[0027] As for these pigments, according to the desirable mode of this invention, it is desirable to be added by the ink constituent as pigment distribution liquid which was distributed in the aqueous medium and obtained with the dispersant or the surfactant. The dispersant commonly used as a desirable dispersant although pigment distribution liquid is prepared, for example, a macromolecule dispersant, can be used. In addition, probably, it will be clear to this contractor that the dispersant and surfactant which are contained in this pigment distribution liquid function also as the dispersant and surfactant of an ink constituent.

[0028] The addition of the coloring material in an ink constituent has about 0.5 - 25% of the weight of a desirable range, and it is about 2 - 15% of the weight of a range more preferably.

[0029] B. The oligomer contained in the ink constituent of oligomer or a monomer this invention is the molecule which has the relative molecular mass of the size of a degree in the middle, and say a thing with the structure which consisted of recurrence of the a small number of time of the unit acquired from the small molecule of a relative molecular mass substantially or notionally. Moreover, the oligomer used in this invention is also called a photopolymerization nature prepolymer, a base lysine, or acrylic oligomer.

[0030] oligomer -- as a functional group -- an acryloyl machine -- 1- since it has some, it has the property which starts a monomer etc. and polymerization reaction by UV irradiation etc., and constructs for which a bridge and carries out a polymerization

[0031] Polyester acrylate, polyurethane acrylate, epoxy acrylate, polyether acrylate, oligo acrylate, alkyd acrylate, polyol acrylate, etc. are mentioned by the molecular structure which constitutes a skeleton, and the oligomer used in this invention is polyester acrylate and polyurethane acrylate preferably.

[0032] the thing of the range whose molecular weight of the oligomer used for this invention is 5,000 to about 20,000 -- the thing of about 500 to 10,000 range is used preferably

[0033] When coming to contain oligomer in the ink constituent in this invention, the contents of the oligomer in an ink constituent are about 1 - 50% of the weight of a range, and a range which is about 3 - 30 % of the weight preferably.

[0034] The monomer contained in the ink constituent of this invention means the molecule which may serve as a composition unit of the basic structure of a macromolecule. Moreover, the monomer used in this invention is also called photopolymerization nature monomer, and single organic-functions acrylate and polyfunctional acrylate are contained.

[0035] The monomer has the acrylate structure of a low-molecular polyol, and has the feature that hardenability is quick, by hypoviscosity.

[0036] The monomer used in this invention as a typical thing Diethylene glycol diacrylate, Neopentyl glycol diacrylate, 1, 6-hexanediol diacrylate, Hydronalium KISHIPI operation phosphoric ester NEOPENCHINRU glycol diacrylate,

Trimethylolpropane triacrylate, PENTAERISUTORUTORI acrylate, Dipentaerythritol hexa acrylate, a bitter taste roil morpholine, 2-phenoxy ethyl acrylate, phthalic-acid hydrogen-(2, 2, and 2-thoria clo yloxy methyl) ethyl, A JIPENTA ERIS toll polyacrylate, a JIPENTA ERIS toll polyacrylate, etc. go up. preferably They are a bitter taste roil morpholine, 2-phenoxy ethyl acrylate, phthalic-acid hydrogen-(2, 2, and 2-thoria clo yloxy methyl) ethyl, a JIPENTA ERIS toll polyacrylate, and a JIPENTA ERIS toll polyacrylate.

[0037] the range whose molecular weight of the monomer used for this invention is 100 to about 3,000 -- the thing of about 100 to 2,000 range is used preferably

[0038] When coming to contain a monomer in the ink constituent of this invention, the contents of the monomer in an ink constituent are about 1 - 70% of the weight of a range, and a range which is about 3 - 50 % of the weight preferably.

[0039] In addition oligomer and a monomer copolymerize, and have the property formed into 3 dimension. Therefore, it is necessary to define the content of the oligomer or the monomer in an ink constituent in consideration of polymerization efficiency, a rate of polymerization, the resistance contraction after a polymerization, polymerization coat intensity, etc.

[0040] Furthermore, when either the ink constituent in this invention or reaction mixture contains oligomer, another side contains a monomer.

[0041] C. It comes to contain a coloring material, oligomer or a monomer, and an aqueous solvent in an aqueous solvent and the ink constituent of other component this invention at least. Furthermore, as arbitrary components, you may add a resin emulsion, inorganic-oxide colloid, a wetting agent, pH modifier, antiseptics, an antifungal agent, etc.

[0042] The reaction mixture used for a reaction mixture A, polymerization initiator this invention comes to contain a polymerization initiator. A polymerization initiator absorbs the ultraviolet rays of a 250nm - about 450nm field, generates a radical or ion, and the polymerization of oligomer and a monomer is made to start.

[0043] The polymerization initiator used for the reaction mixture of this invention as a typical thing A benzoin methyl ether, Benzoin ethyl ether, the isopropyl benzoin ether, the isobutyl benzoin ether, The 1-phenyl -1, a 2-propane dione-2-(o-ethoxycarbonyl) oxime, A benzyl, a diethoxy acetophenone, a benzophenone, a chloro thioxan ton, 2-chloro thioxan ton, an isopropyl thioxan ton, 2-methylthio xanthone, the poly chlorination polyphenyl, a hexachlorobenzene, etc. are mentioned, better [good] ** which goes. They are the isobutyl benzoin ether, the 1-phenyl -1, and a 2-propane dione-2-(o-ethoxycarbonyl) oxime.

[0044] Moreover, Vicure 10 and 30 (product made from Stauffer Chemical), Irgacure 184, 651, 2959, 907, 369, 1700, 1800, 1850, and 819 (Ciba Specialty Chemicals make), Darocure 1173 (product made from EM Chemical), Quantacure CTX, ITX (product made from Aceto Chemical), Lucirin An available polymerization initiator can also be used with the tradename of TPO (BASF A.G. make).

[0045] B. As the oligomer used for the reaction mixture of oligomer or a monomer this invention, and a monomer, the same thing as an ink constituent is mentioned. Also about the desirable oligomer and desirable monomer, you may be the same as that of the case of an ink constituent.

[0046] When coming to contain oligomer in the reaction mixture of this invention, the contents of the oligomer in reaction mixture are about 1 - 50% of the weight of a range, and a range which is about 3 - 30 % of the weight preferably.

[0047] When coming to contain a monomer in the reaction mixture of this invention, the contents of the monomer in reaction mixture are about 1 - 70% of the weight of a range, and a range which is about 3 - 50 % of the weight preferably.

[0048] In addition, oligomer and a monomer copolymerize and have the property formed into 3 dimension. Therefore, it is necessary to define the content of the oligomer or the monomer in reaction mixture in consideration of polymerization efficiency, a rate of polymerization, the resistance contraction after a polymerization, polymerization coat intensity, etc.

[0049] Furthermore, when either the ink constituent in this invention or reaction mixture contains oligomer, another side contains a monomer.

[0050] C. The reaction mixture in an aqueous solvent and other component this invention comes to contain a polymerization initiator, oligomer or a monomer, and an aqueous solvent at least. Furthermore, as arbitrary components, you may add polyvalent metallic salt, the poly allylamine or its derivative, a wetting agent, pH modifier, antiseptics, an antifungal agent, etc.

[0051]

[Example] The following example explains this invention still in detail. Therefore, the following example only carries out instantiation listing, in order to understand the content of this invention easily, and it does not limit the range of this invention at all.

[0052] The ink constituent and reaction mixture of composition (weight ratio) as shown in one or less example were created.

[0053]

An ink constituent An aqueous titanium oxide dispersing element (12% of pigment contents) 80% An acrylic monomer (*1) 20% Reaction mixture Urethane acrylic oligomer 40% aqueous emulsion (*2) 50% A polymerization initiator (*3) 1% Water 49% (*1): bitter taste roil morpholine (Nippon Kayaku [Co., Ltd.] Co., Ltd. make) (*2): NR-440 (Zeneka [Co.] Co. make) (*3): IRUGA cure 1700 (product made from tibia special tee KEMIKARUZU)

[0054] The head for ink-jet record was filled up with the ink constituent and reaction mixture of the above-mentioned composition, and it printed by making it breathe out on the vinyl chloride which is a record medium, an acrylic, a polycarbonate, and a printed circuit board. The turn of pixel formation of ink breathed out the ink constituent upwards, and performed the regurgitation for reaction mixture in piles. UV irradiation was performed after 10-minute dryness at 50 degrees C after that. The record intermediation body surface after the hardening reaction of the ink constituent and reaction mixture by UV irradiation does not have stickiness, and was hardened completely.

[0055] The ink-jet recording device used ink jet printer MJ930C (the SEIKO EPSON company make), the addition quantity of light [in / 365nm / the irradiation lamp used for UV irradiation is a metal halide type, and] -- 2000 mJ/cm2 it was .

[0056] It evaluated by performing the following examinations about the printing object, the ink constituent, and reaction mixture which were printed by the record medium.

[0057] a. It is JIS to the printing object printed by the pencil hardness-test record medium. The method specified to K5400 (the pencil ***** examination writing-by hand method) estimated the degree of hardness of a printing object. The printing object obtained the degree of hardness of 4H as a result of the pencil hardness test.

[0058] b. After making the printing object printed by the resistance to solvents test record medium immersed for 5 minutes into ethanol, it took out and ground against the gear-tooth brush five round trips.

[0059] The printing object did not separate as a result of the resistance to solvents test.

[0060] c. The action which uses, sticks and removes a tape in the printing object printed by the sticking tendency test-record medium was performed 3 times. Scotchtape 810-3-18 by Sumitomo 3 M company was used for the tape. The printing object

did not separate as a result of the sticking tendency test examination.

[0061] d. After leaving a preservation stability-test ink constituent and reaction mixture for ten days in ordinary temperature, the head for ink-jet record was filled up like the above, and it breathed out to the record medium with the ink jet printer. As a result of the preservation stability test, plugging of a head, the flight deflection of a printing object, etc. did not occur, but were able to be stabilized and were able to be printed to the record medium.

[0062] The ink constituent and reaction mixture of composition (weight ratio) as shown two or less example were created. An ink constituent An aqueous titanium oxide dispersing element (15% of pigment contents) 60% Urethane acrylic oligomer 40% aqueous emulsion (*2) 40% Reaction mixture An acrylic monomer (*1) 20% A polymerization initiator (*3) 2% Water 78% (*1) : bitter taste oil morpholine (Nippon Kayaku [Co., Ltd.] Co., Ltd. make) (*2) : NR-440 (Zeneca [Co.] Co. make) (*3) : IRUGA cure 2959 (product made from tibia special tee KEMIKARUZU)

[0063] The ink constituent and reaction mixture of the above-mentioned composition were printed like the example 1. The record intermediation body surface after the hardening reaction of the ink constituent and reaction mixture by UV irradiation does not have stickiness, and was hardened completely.

[0064] It evaluated by performing the same examination as the above-mentioned example 1 about the printing object, the ink constituent, and reaction mixture which were printed by the record medium.

[0065] The printing object obtained the degree of hardness of 4H as a result of the pencil hardness test. The printing object did not separate as a result of the resistance to solvents test. The printing object did not separate as a result of the sticking tendency examination. As a result of the preservation stability test, plugging of a head, the flight deflection of a printing object, etc. did not occur, but were able to be stabilized and were able to be printed to the record medium.

[0066] Four kinds of ink constituents and reaction mixture of composition (weight ratio) as shown in three or less example were created.

Ink constituent Urethane acrylic oligomer 40% aqueous emulsion (*2) 40% Glycerol 5% Styrene-acrylic-acid copolymer (dispersant) 1% The following coloring material was mixed the whole component to this by having made the above-mentioned mixture into the fundamental component, and four kinds of ink constituents were created. The remaining weight section was water.

C. I. pigment blue 15:3 2% C. I. pigment red 122 3% C. I. pigment yellow 74 2% Carbon black MA 7 (*4) 5% Reaction mixture An acrylic monomer (*1) 3% Urethane acrylic oligomer 40% aqueous emulsion (*2) 50% A polymerization initiator (*3) 2% ethylene glycol T0% Water 35% (*1) : bitter taste oil morpholine (Nippon Kayaku [Co., Ltd.] Co., Ltd. make) (*2) : NR-440 (Zeneca [Co.] Co. make) (*3) : 1:1 mixture of the IRUGA cures 184 and 907 (product made from tibia special tee KEMIKARUZU)

(*4) Four kinds of ink constituents and reaction mixture of the Mitsubishi Chemical above-mentioned composition were printed like the example 1. The record intermediation body surface after the hardening reaction of the each ink constituent 4 kind and reaction mixture by UV irradiation does not have stickiness, and was hardened completely.

[0067] It evaluated by performing the same examination as the above-mentioned example 1 about the printing object, four kinds of ink constituents, and reaction mixture which were printed by the record medium. Four sorts of printing objects obtained the degree of hardness of 4H as a result of the pencil hardness test. Four sorts of printing objects did not separate as a result of the resistance to solvents test. Four sorts of printing objects did not separate as a result of the sticking tendency examination. As a result of the preservation stability test, plugging of a head, the flight deflection of a printing object, etc. did not occur, but were able to be stabilized and were able to be printed to the record medium.

[0068] The ink constituent of composition (weight ratio) as shown in one or less example of comparison was created.

An aqueous titanium oxide dispersing element (15% of pigment contents) 50% Acrylic monomer (*1) 2% Urethane acrylic oligomer 40% aqueous emulsion (*2) 40% Polymerization initiator (*3) 1% Water 7% (*1) : bitter taste oil morpholine (Nippon Kayaku [Co., Ltd.] Co., Ltd. make) (*2) : NR-440 (the Zeneca [Co.] Co. make, tradename) (*3) : IRUGA cure 1700 (product made from tibia special tee KEMIKARUZU)

The ink constituent of the above-mentioned composition was printed like the example 1. It was lusterless although stickiness did not have the record intermediation body surface after a hardening reaction with the ink constituent by UV irradiation.

[0069] It evaluated by performing the same examination as the above-mentioned example 1 about the printing object and ink constituent which were printed by the record medium. As for the printing object, only the degree of hardness of H was obtained as a result of the pencil hardness test. All printing objects separated as a result of the resistance to solvents test. All printing objects separated as a result of the sticking tendency examination. As a result of the preservation stability test, an ink constituent was not able to be got blocked into the head and it was not able to print.

[0070] The ink constituent of an example and the example of comparison, reaction mixture, and a pencil hardening test result are as having been shown in the following table 1.

[0071]

[Table 1]

	インク組成物	反 応 液	鉛筆硬度 試験結果
実施例 1	酸化チタン，モノマー，水	開始剤，オリゴマー，水	4 H
実施例 2	酸化チタン，オリゴマー，水	開始剤，モノマー，水	4 H
実施例 3	顔料，オリゴマー，水	開始剤，モノマー，水	4 H
比較例 1	酸化チタン，開始剤， モノマー，オリゴマー，水		H

[Translation done.]